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POSTAL RATE AND FEE CHANGES, 2000 — Docket No. R2000–1

DIRECT TESTIMONY
OF
ANTHONY M. YEZER
ON BEHALF OF
UNITED STATES POSTAL SERVICE

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Direct Testimony
Of
Anthony M. Yezer

Autobiographical Sketch

My name is Anthony M. Yezer. I am currently Professor of Economics at the George Washington University and special consultant to the National Economic Research Associates, n/e/r/a. I have been a Professor of Economics since 1985 and special consultant since 1995. Previously I was Assistant Professor (1972-1976) and Associate Professor (1977-1985) at George Washington University where my teaching concentrates on regional and urban economics. During my tenure at George Washington University, I have served as a consultant to many organizations, including agencies of the United States government. I have also worked on several substantial sponsored research projects, i.e. research performed at and by George Washington University but sponsored by external organizations, including the National Science Foundation.

My academic awards include an National Defense Education Act Fellowship, National Collegiate Athletic Association Scholar-Athlete Fellowship, and finalist status in the Rhodes Scholarship competition for the middle Atlantic states.

I have been a fellow of the Homer Hoyt School of Advanced Studies in Real Estate and Urban Economics since 1991. I currently serve on the editorial

boards of four journals, and edit the monograph series sponsored by the American Real Estate and Urban Economics Association.

I have published over thirty articles in refereed journals and numerous papers in other venues. Much of this research concentrates on real estate and urban economics.

In 1966, I was awarded a B.A. degree from Dartmouth College and earned an M.Sc. in economics from the London School of Economics and Political Science in 1967. My doctoral degree in economics and urban studies from the Massachusetts Institute of Technology was conferred in 1974.

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Estimation of Postal Service Facility Rental Costs

I. Purpose and Background

The purpose of this testimony is to present results from a sponsored research project conducted by the Center for Economic Research in the Department of Economics at the George Washington University for use by the Postal Service and, ultimately, by the Postal Rate Commission in setting appropriate fees for post office box service. This testimony explains the procedures used to provide a statistically valid means of predicting the current rental value of space used by the Postal Service to provide post office box service. I understand that the Postal Service will use my results to allocate its space provision costs to post office boxes located throughout the United States. The academic novelty of this project is the creation from Postal Service data on property leases the first standardized nationwide estimates of current real estate rents.

The first task of this project was to construct a statistical model of the determinants of rent per square foot at postal facilities across the United States. A second task was to predict expected rent per square foot for specific facilities assuming that the leases were signed for a specific term at a given

time. The research was undertaken beginning August, 1998 and continued until September, 1999 when a set of predicted rents per square foot was delivered to the Postal Service.

The problem of predicting rents in real estate markets is far from new in the academic literature. Substantial statistical effort has been applied to this problem, concentrating on rented residences where massive data sets are available. A significantly smaller group of papers has considered office rents in selected cities. The predictive model developed in this research is consistent with that literature, but the overall estimation effort is conducted at a far larger scale because predictions for the entire United States are a necessary product of the effort.

It is important to differentiate the predicted rent per square foot reported here from an index of rental price differences over space. Because the characteristics of postal facilities differ, predicted rent per square foot can vary even if the rental price for identical units is constant. For example, rent per square foot generally decreases with facility size. Therefore, other things being equal, we expect the predicted rent per square foot to fall with the number of square feet in the facility. In contrast, a rental price index is based on estimates of the rent per square foot for a standard size and type of facility in alternative locations. While the econometric model developed in this research can be used to predict either rent per square foot of specific facilities or an

index of rental price differences over space, the Postal Service chose only the former for presentation to the Postal Rate Commission.

The next section of this testimony addresses the approach taken to develop and estimate an econometric model of facility rent determinants. The third section discusses data sources, and data preparation procedures. In the fourth section, estimation results are discussed.

II. The Modeling Approach Adopted in this Study

The objective of the modeling effort is to produce estimates of the rent per square foot at Postal Service facilities, particularly those facilities that provide post office box service. The approach taken to modeling rent per square foot follows efforts in the literature to account for rents in terms of lease provisions and property characteristics. Data on leased properties, used in both this study and previous research, include measures of annual rent paid, square feet of space rented, date of endorsement and term of the lease, provisions for payments of utility and maintenance costs, physical characteristics of the space, and the physical location of the property. Rents are based on all these factors, and vary with market conditions at the time that the lease is signed.

Because this study must project rent per square foot into the future, beyond the time when the last lease was endorsed, it is necessary to provide a mechanism in the model to project rents per square foot forward based on

recent market trends. Therefore, it is important that the predictions be based on variables that are observable at the time that the predictions are made. For example, the model could have included readily available national price indexes such as the Consumer Price Index, or the Producer Price Index. However, providing projections of future rents also requires projecting these indexes forward, thus introducing a potential source of error and controversy in the rent estimation process. Accordingly, the model developed here does not include any explanatory variables that require projection forward to produce predictions of future rent per square foot.

The variables used in the statistical analysis presented here are all taken from Postal Service data. A detailed discussion of the data and the procedures used to get them ready for statistical analysis is provided in the next section of this testimony. It is useful to group the variables into the following general categories.

1. The dependent variable in the statistical analysis is the quotient of total annual rent for the entire facility divided by size of the rented space in square feet, for facility j; it is useful to refer to this variable as $R/SQFT_j$.

2. A vector of seven dummy variables, noted as M_{ij}, reflects responsibility for maintenance and utilities including: maintenance, electricity, heating, trash, sewage, snow removal, and custodial services. To the extent that the Postal Service is responsible for providing these functions, the rent should be lower.

3. A vector of eight dummy variables, noted as S_{mj}, indicating the facility setting including: business park, office building, mall, shopping center, store front, general retail, supermarket, and other setting. Setting should have an effect on rent per square foot. For example, facilities within malls are generally higher cost.

4. Variables that indicate the time at which the current lease was endorsed. Time is measured annually with 1960 = 1. One time variable, T_j, is simply the time measure and the other, $T95_j$, is equal to zero before 1995 and equal to time thereafter. It is expected that rents have risen over time in most markets and hence the effect of time, T_j, should be positive. The effect of the second time variable, $T95_j$, is the difference between the annual rate of increase over the entire period and the annual rate of increase since 1995, which could be positive (negative) if rents have been increasing faster (slower) since 1995. A third endorsement time variable, DT_j, is a dummy indicating that the endorsement date is missing.

5. Variables that reflect lease length, TL_j and DTL_j. It is expected that longer leases have higher level payments to compensate owners for the effects of inflation. Lease length in years is measured by TL_j, DTL_j is a dummy variable equal to one if the lease is less than two years or length was missing. Short term leases likely reflect special needs, including seasonal demands for space at facilities that are unlikely to provide post office box service.

6. Dummy variables that indicate physical features of the facility such as: branch offices, B_j; presence of a loading dock, D_j; and missing information on interior space, DI_j. The natural logarithm of the square feet of interior space, LI_j is also included. The effects of the dummy variables on rent per square foot are not clear, but there is a strong expectation that cost per square foot should fall with increasing facility size. Because rent per square foot should decrease at a decreasing rate as size increases, the estimation is based on the logarithm of interior space. The use of this functional form is not uncommon in the literature.

7. Two dummy variables, NoP_j and P_j, that reflect specific provision for parking space in the lease. The first dummy variable indicates that there is no provision for parking or that provision is missing and the second variable indicates that parking is provided but total parking space is less that one thousand square feet. Compared to the reference case in which the lease provides for more than one thousand square feet of parking, both of these parking variables should be associated with lower rent per square foot.

8. A vector of variables, L_{kj}, that measures the physical location of the facility. Two different versions of these variables appear in the rent per square foot equations. For facilities located within larger MSAs (specifically the 65 largest MSAs), location was based on the distance between the facility and the center of the central business district (CBD) as well as distance north-south or

east-west from the CBD. The CBD was located and distances computed automatically using geographic information systems (GIS) software - specifically Map Info. The expectation is that rents should decline with distance from the CBD although this effect may not be significant in cities with multiple centers. For facilities located outside larger MSAs, the data were grouped by state or by groups of states where grouping was needed to increase sample size. Then location was characterized by dummy variables for individual counties provided that the county had at least ten facilities. Experimentation indicated that county dummy variables were generally non-significant, either statistically or quantitatively, when the number of facilities in the county was small. Essentially rents tend to be low unless there is some concentration of economic activity which tends to increase Postal Service activity.

Based on the previous discussion, the general form of the equation used to estimate rent per square foot is given below:

1) $$R/SQFT_j = \alpha_0 + \Sigma_{\alpha=1} \alpha_i M_{ij} + \Sigma_{\beta=1} \beta_m S_{mj} + \Theta_T T_j + \Theta_{T95} T95_j + \Theta_{DT} DT_j + \Theta_{TL} TL_j + \Theta_{DTL} DTL_j + \Theta_B B_j + \Theta_D D_j + \Theta_{ID} ID_j + \Theta_{LI} LI_j + \gamma_{NoP} NoP_j + \gamma_P P_j + \Sigma_{k=1} \lambda_k L_{kj} + \epsilon_j$$

loading dock D_j, interior space (ID_j and LI_j), parking (NoP_j and P_j), and location (L_{kj}). ϵ_j is an identically and independently distributed random error term. The other Greek letters indicate parameters to be estimated statistically and are used to predict rent per square foot for facilities with specific characteristics measured by the variables.

Equation (1) includes a number of dummy variables which are equal to unity in cases where a particular independent variable is missing and zero otherwise. Such variables only appear in equations where at least some observations on that independent variable are actually missing. The use of this dummy variable technique to deal with missing values of independent variables reflects a general practice of attempting to include observations even if some items in the data record are missing or take on improbable values.

Measurement error in the dependent variable, $R/SQFT_j$, *in equation (1) is* resolved by including all observations for which $R/SQFT_j > 0$. Casewise deletion of facilities with rent equal to zero is based on the possibility that these are not really rental facilities and the certainty that these rents could not reflect market rents. Additional issues of measurement error in the dependent variable are addressed by the use of robust regression estimation techniques. Specifically, the robust regression technique, rreg, available in the STATA statistical software package, version 5.0, is used. This technique first constructs ordinary least squares estimates of equation (1) and then deletes any

ownership and fields containing rent and lease terms, 27,407 were classified as leased and 11,608 as owned, while 434 were so incomplete that their status could not be determined.

Examination of the lease records indicated that there were cases in which multiple leases had been endorsed for the same physical address. The multiple lease cases were examined and found to reflect separate lease contracts for various aspects of a single facility. For example, separate leases might appear for a branch office, the loading dock of that branch, parking at the branch, and/or an annex attached to the branch. Furthermore, it is evident that the rents associated with these individual leases are not independent. Rent for the parking, loading dock, or annex is often trivial compared to rent for the main facility, indicating that facility rent includes an implicit payment for parking, etc. Of course, the vast majority of facilities have one rental payment for a single lease that covers the branch, loading dock, parking, etc. Similarly for owned facilities, multiple records were not uncommon. Presumably this reflects acquisition or construction of different parts of the facility at different times with separate records entered for each phase of the acquisition or construction activity.

Accordingly, multiple leases at the same physical address are combined, i.e. the lease payments are summed to a total facility lease payment and the physical characteristics, such as square feet of space, are aggregated. This

results in a total of 25,606 distinct leased facilities (1,801 redundant lease records are eliminated by combining leases for a single facility), 9,997 owned facilities (1,611 records are eliminated based on ownership of different aspects of the same facility) and the 434 unusable records are combined to reflect only 407 different physical locations.

The variables used in the statistical analysis are all taken, directly or indirectly, from the records in this data set. In some cases, such as square feet of space, the data record includes duplicate measures of a given variable, i.e. the variable is recorded in more than one field. Where there are multiple fields indicating a measure, the median value is used except when the median is logically precluded. For example, if two of the three fields indicate zero square feet of space, then the third field, indicating positive space, is used. As noted in the previous section, a series of dummy variables is used to indicate cases in which a variable was missing or took on an illogical value, e.g. lease length equal to zero.

Location of the facility is determined by application of a geographic information system (GIS) to the physical address of the facility. In the case of facilities located outside the 65 large MSAs identified in this analysis, location is based on county. For facilities in one of the 65 large MSAs, the GIS program (Map Info) is used to locate the latitude and longitude of the facility. Then using the latitude and longitude of the center of the CBD for that MSA, as

determined in the GIS program, the radial distance from the CBD center to the facility is computed. Then the distances north-south and east-west are computed. Note that, for facilities located south of the CBD center, north-south is negative and similarly the value of east-west for facilities to the west of the CBD center is negative.

The time measure used in this analysis is annual and time is measured in years with 1960 equal to 1. For observations of leases where a time measure such as time since lease endorsement or lease length is missing, the time measure is set equal to zero but a dummy variable equal to unity when time is missing and zero when it is present is included in the data set to distinguish these observations. This is consistent with my general practice of avoiding casewise deletion as a response to missing observations.

IV. Results from Estimates of the Rent per Square Foot Equation

This section discusses the results of estimating Equation (1) from section II of this testimony using the 25,606 observations of Postal Service leases discussed in section III. The estimation technique is the robust regression routine from STATA version 5.0. The estimating equation differs between models fitted to the 65 largest MSAs and the "non-metro" state areas because location is characterized by precise distance measures for the former case and by county for the latter.

I gave close consideration to determining the best method for aggregating the data into geographic areas. On the one hand, because real estate pricing is determined at a local level, one could estimate separate equations for small geographic areas. Moreover, estimating a single equation across large regions makes uniform the effects of the independent variables on rent per square foot, thereby suppressing the spatial variation being examined. However, mitigating against extreme geographic disaggregation is the tendency for precision to fall with sample size. Thus the final level of geographic disaggregation adopted in these estimates is based on a round of initial experimentation in which sample sizes below 200 were judged to yield rather imprecise results. As a result, estimates for large states and very large MSAs are often performed separately. But smaller states and MSAs are grouped in order to enlarge sample sizes.

For all geographic areas, estimation results begin with an attempt to force all variables in equation (1) into the regression. However, some of the variables are not appropriate for a given equation. The most common reason that a variable is not appropriate is that the measure is not present in a subset of the data. For example, time is not always missing and hence a time zero or missing dummy variable is not always appropriate. Some of the setting types are not present always and, occasionally some of the lease provisions for maintenance and utilities are not present - e.g. snow removal in Florida. For two states, Alaska and South Carolina, the robust regression results do not converge

properly and ordinary lease squares estimates are used.

The econometric estimates, supporting data, and resulting rental values can be reviewed by a party requesting access and willing to sign a non-disclosure agreement.